



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,038	02/09/2005	Kiyotaka Ishibashi	265770US26PCT	4852

22850	7590	06/14/2007
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.		
1940 DUKE STREET		
ALEXANDRIA, VA 22314		

EXAMINER	
DHINGRA, RAKESH KUMAR	

ART UNIT	PAPER NUMBER
1763	

NOTIFICATION DATE	DELIVERY MODE
06/14/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary

Application No.

10/524,038

Applicant(s)

ISHIBASHI ET AL.

Examiner

Rakesh K. Dhingra

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 February 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2/9/05 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 07/05,09/05
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

Figures 6, 7 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5, 8, 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Ino et al (JP 2001-167900).

Regarding Claims 1, 10: Ino et al teach an apparatus (Figure 1) comprising:

A chamber 1 for accommodating a substrate W, a dielectric member 2 (top plate unit) serving as a partition wall, and comprising a flat plate portion and a side wall portion and wherein there is a smooth and curved surface extending between the sides of the flat pate portion and the sides of the side wall

Art Unit: 1763

portion, and an antenna unit 6 connected to top face of dielectric member and which supplies high frequency electromagnetic field for forming plasma in the chamber (paragraphs 0017-0019).

Regarding Claim 5: Ino et al teach a gas inlet 5 disposed to inject gas along side wall portion (Figure 1).

Regarding Claim 8: Ino et al teach an antenna 6 having slots (Figure 1 and paragraphs 0019, 0020).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2, 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ino et al (JP 2001-167900) in view of Berry (US Patent No. 5,466,991).

Regarding Claims 2,3: Ino et al teach all limitations of the claim except thickness of the side wall portion of the top plate.

Berry teaches an ECR apparatus (Figures 1, 7) wherein a non-planar window 12a is used to improve plasma uniformity by improving coupling of microwaves into the plasma chamber. Berry further teaches that shape of window could be altered to provide equivalent results. Berry further teaches that thickness of window at the periphery (where side wall is there) is chosen to maximize transmitted microwave power, and often it is one quarter of wavelength in the window (column 7, line 50 to column 8, line 65). Though Berry does not teach thickness of side wall portion of top plate, it would be obvious to optimize the thickness of the side wall portion of the window, since window thickness acts a result effective variable, to control maximization of transmitted microwave power, as taught by Berry.

Therefore it would have been obvious to one of skills in the art at the time of the invention to optimize thickness of side wall portion of the top plate as taught by Berry in the apparatus of Ino et al to maximize coupling of transmitted microwave power into the plasma chamber.

Further, it has been held by the courts (Case law):

1) It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

2) It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

3) Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Claims 6, 7, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ino et al (JP 2001-167900) in view of Ishii et al (US PGPUB No. 2002/0038692).

Regarding Claim 6: Ino et al teach all limitations of the claim including a top plate with a side wall portion that is in contact with the chamber portion, but do not teach that chamber portion in contact with the side wall is conductive.

Ishii et al teach a plasma apparatus (Figures 17) wherein a non-planar window 13A is in contact with chamber 11 which is made from aluminum (conductive) [paragraph 0049].

Therefore it would have been obvious to one of skills in the art at the time of the invention to use chamber wall made from conductive material as taught by Ishii et al in the apparatus of Ino et al to enable provide grounding of chamber wall.

Regarding Claim 7: Ishii et al teach that top plate can be of bell-jar shape to enable isolate the chamber side wall from plasma reaction products (Figure 18 and paragraph 0058).

Regarding Claim 9: Ishii et al teach a gap between the top plate 18 side wall and the chamber wall 11A (Figure 18).

Claims 11, 12, 17, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ino et al (JP 2001-167900) in view of Chen et al (US Patent No. 5,234,526).

Regarding Claims 11,17: Ino et al teach all limitations of the claim (as already explained above under claim 1) except that thickness of sidewall portion is smaller than that of flat plate portion.

Chen et al teach a plasma apparatus (Figure 5) comprising a chamber 3 and a microwave penetrable substance 29 (top portion) comprising a flat plate portion and a side wall portion and where thickness of sidewall portion of top portion 29 is smaller than that of flat plate portion. Chen et al further teach that thickness distribution or optimum configuration of top portion 29 depends upon characteristics of generated plasma like plasma density and dielectric constant of plasma which in turn are determined by gas pressure, magnetic field strength etc. Thus thickness distribution of the top portion 29 is a result effective variable which is optimized based upon process parameters like gas pressure, magnetic field strength etc (column 9, line 55 to column 10, line 13).

Therefore it would have been obvious to one of skills in the art at the time of the invention to use a top plate whose thickness distribution for the side wall and the flat plate portion is optimized as taught by Chen et al in the apparatus of Ino et al as per process variables like gas pressure, magnetic field strength etc.

Further, it has been held by the courts (Case law):

1) It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

2) It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

3) Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Regarding Claim 12: Ino et al teach an antenna 6 having slots (Figure 1 and paragraphs 0019, 0020).

Regarding Claim 19: Ino et al teach a gas inlet 5 disposed to inject gas along side wall portion (Figure 1).

Claims 13, 14, 18, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ino et al (JP 2001-167900) in view of Chen et al (US Patent No. 5,234,526) as applied to Claim 11 and further in view of Ishii et al (US PG PUB No. 2002/0038692).

Regarding Claim 13,18: Ino et al in view of Chen teach all limitations of the claim except a gap provided between the side wall of the top plate portion and the chamber.

Ishii et al teach a plasma apparatus (Figures 18) wherein a top plate 18 is such disposed so that a gap exists between the top plate 18 side wall and the chamber wall 11A (Figure 18).

Therefore it would have been obvious to one of skills in the art at the time of the invention to teach a gap between the top plate side wall and the chamber as taught by Ishii et al in the apparatus of Ino et al in view of Chen et al to enable isolate the conductive wall of the chamber from the dielectric top plate.

Regarding Claim 14: Ino et al teach that top plate 2 is in contact with the chamber wall 3 (Figure 1).

Regarding Claim 20: Ino et al in view of Chen et al and Ishii et al teach that top plate 2 is in contact with chamber wall 3 which is made from aluminum (Ishii et al – paragraph 0049).

Claims 15, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ino et al (JP 2001-167900) in view of Chen et al (US Patent No. 5,234,526) as applied to claim 11 and further in view of Berry (US Patent No. 5,466,991).

Regarding Claims 15, 16: Ino et al in view of Chen et al teach all limitations of the claim including that thickness distribution or optimum configuration of top portion 29 depends upon characteristics of generated plasma like plasma density and dielectric constant of plasma which in turn are determined by gas pressure, magnetic field strength etc.

Ino et al in view of Chen et al do not explicitly teach that thickness of side wall portion of the top plate has a thickness of $\lambda/4$ or greater where λ is the wavelength of high frequency electromagnetic field based upon the dielectric constant of the top plate unit.

Berry teaches an ECR apparatus (Figures 1, 7) wherein a non-planar window 12a is used to improve plasma uniformity by improving coupling of microwaves into the plasma chamber. Berry further teaches that shape of window could be altered to provide equivalent results. Berry further teaches that thickness of window at the periphery (where side wall is there) is chosen to maximize transmitted microwave power, and often it is one quarter of wavelength in the window (column 7, line 50 to column 8, line 65). Though Berry does not teach thickness of side wall portion of top plate, it would be obvious to optimize the thickness of the side wall portion of the window, since window thickness acts a result effective variable, to control maximization of transmitted microwave power, as taught by Berry.

Therefore it would have been obvious to one of skills in the art at the time of the invention to optimize thickness of side wall portion of the top plate as taught by Berry in the apparatus of Ino et al in view of Chen et al to maximize coupling of transmitted microwave power into the plasma chamber.

Further, it has been held by the courts (Case law):

1) It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

2) It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

3) Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. It would have been obvious to one having ordinary skill in the art to have determined the optimum values of the relevant process parameters through routine experimentation in the absence of a showing of criticality. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or

claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1) Claims 1, 8 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2 of U.S. Patent No. 6,953,908 in view of Ino et al (JP 2001-167900).

Regarding Claims 1, 8: Claims 1, 2 of the patent teach a plasma processing apparatus comprising:

A chamber, a dielectric member (top plate) with a circumferential projection that has a curved surface on edge shaped portion, on its lower surface (like a side wall of top plate), and an antenna for supplying high frequency electromagnetic field into chamber.

Claims 1, 2 of the patent do not teach top plate having a flat plate portion that is in contact with the antenna and also do not explicitly teach that sides of the flat plate portion and the side wall portion facing the plasma generation region have a smooth and curved surface extending between the flat plate portion and the side wall portion.

Ino et al teach an apparatus (Figure 1) comprising:

A chamber 1 for accommodating a substrate W, a dielectric member 2 (top plate unit) serving as a partition wall, and comprising a flat plate portion and a side wall portion and wherein there is a smooth and curved surface extending between the sides of the flat plate portion and the sides of the side wall portion, and an antenna unit 6 with plurality of slots connected to top face of top plate and which supplies high frequency electromagnetic field for forming plasma in the chamber (paragraphs 0017-0019).

Therefore it would have been obvious to one of skills in the art at the time of the invention to use a top plate with shape as taught by Ino et al in the apparatus of Claims 1, 8 to enable supply larger amount of microwave power at the side wall portion of the chamber than at the central portion of the chamber.

Claim 1 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of copending Application No. 10/570,631 (US PG PUB No. 2007/0113788) in view of Ino et al (JP 2001-167900).

Regarding Claim 1: Claim 1 of the co-pending application teach a plasma processing apparatus comprising:

A chamber, a top plate with a ring shaped ridge on its lower surface (like a side wall of top plate), and an antenna with plurality of slots for supplying high frequency electromagnetic field into chamber.

Claim 1 of the co-pending application does not teach top plate having a flat plate portion that is in contact with the antenna, and also do not explicitly teach that sides of the flat plate portion and the side wall portion facing the plasma generation region have a smooth and curved surface extending between the flat plate portion and the side wall portion.

Ino et al teach an apparatus (Figure 1) comprising:

A chamber 1 for accommodating a substrate W, a dielectric member 2 (top plate unit) serving as a partition wall, and comprising a flat plate portion and a side wall portion and wherein there is a smooth and curved surface extending between the sides of the flat pate portion and the sides of the side wall portion, and an antenna unit 6 with plurality of slots connected to top face of top plate and which supplies high frequency electromagnetic field for forming plasma in the chamber (paragraphs 0017-0019).

Therefore it would have been obvious to one of skills in the art at the time of the invention to use a top plate with shape as taught by Ino et al in the apparatus of Claims 1 to enable supply larger amount of microwave power at the side wall portion of the chamber than at the central portion of the chamber.

This is a provisional obviousness-type double patenting rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Tei et al (US PGPUB No. 2002/0011215) teach an apparatus (Figure 1) comprising- a chamber 101 for accommodating a substrate W, a dielectric plate 106 (top plate unit) serving as a partition wall, and comprising a flat plate portion and a side wall portion and wherein there is a smooth and curved surface extending between the sides of the flat pate portion and the sides of the side wall portion, and an antenna unit 111 for supplying high frequency electromagnetic field for forming plasma in the chamber (paragraphs 0066-0077).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rakesh Dhingra



Parviz Hassanzadeh
Supervisory Patent Examiner
Art Unit 1763